6

PIGEON PT L/F DED 980494603
one pigeon pt. Rd.
New Castle

NPL Search 3/31/87
non-npl Removal RP Search 9/87
Screening Site inspection 3/1/81
Preliminary Assessment 2/1/84-3/1/84
Discovery 9/1/80
Proposed to NPL 1/22/87
103c submitted

NPL-06-2-18

COPY 7-25-89

National Priorities List Site

Hazardous waste site listed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)("Superfund")

PIGEON POINT LANDFILL
New Castle, Delaware

Pigeon Point Landfill covered 187 acres in New Castle, New Castle County, Delaware, along the Delaware River just north of the Delaware Memorial Bridge. It started receiving industrial and municipal wastes in 1968. Before it was a landfill, the U.S. Army Corps of Engineers used the site for disposal of dredge soils from the Delaware and Christiana Rivers. New Castle County operated the site from 1968 through 1981. In 1981, the Delaware Solid Waste Authority (DSWA) took control of site operations. Thereafter, it was permitted by the State to accept municipal wastes. Operations stopped and the site was closed in November 1985. During closure, the site was covered with a 2-foot clay cap and seeded.

Before 1980, according to the Delaware Department of Natural Resources and Environmental Control, wastes disposed at the unlined landfill included paint sludges, metal sludges, petroleum refinery wastes, polyvinyl chloride wastes, chemical process wastes, and phenol resins.

In 1984-85, a consultant to DSWA detected arsenic, benzene, ethylbenzene, and tetrachloroethylene in on-site monitoring wells. Aquifers of both the Columbia and Potomac Formations are at risk. The Artesian Water Co. has nine wells within 3 miles of the site. The water is blended with water from other wells. The public water supply for 150,000 people is potentially affected.

Facility Name: Pigeon Point Landfill

Location: New Castle, Delaware

EPA Region: III

Person(s) in Charge of the Facility: Delaware Solid Waste Authority (DSWA)

Name of Reviewer: "non responsive based on revised scope"
NUS Corporation

Date: July 24, 1986

General Description of the Facility:

The Pigeon Point Landfill is located in New Castle, Delaware, along the Delaware River just north of the west-bound span of the Delaware Memorial Bridge. The site is a 187-acre landfill that has been used for the disposal of industrial and municipal wastes since 1968. Before landfilling, the site was used as a disposal site for dredge spoils from the Delaware and Christina Rivers. The site was operated by New Castle County from 1968 through 1981. In January 1981, the Delaware Solid Waste Authority took control of operations at the site. Operations at the landfill were halted in October 1985, at which time the site underwent final closure. Final cover application at the site was completed in November 1985. Prior to 1980, the waste types reportedly disposed at the site included paint sludges, metal sludges, petroleum refinery wastes, PVC wastes, chemical process wastes, and polylene and phenol resins. Groundwater contamination at the site is of primary concern because arsenic, benzene, ethylbenzene, and tetrachloroethylene have been detected in on-site monitoring wells. Aquifers of both the Columbia and Potomac Formations are at risk. These aquifers are the sources of water for the Artesian Water Company, City of New Castle Water Department, and ICI Americas, Incorporated - Atlas Point Plant within a 3-mile radius of the site. A total population of 155,000 persons receives water from these suppliers.

Scores: $S_M = 37.93$ ($S_{gw} = 65.62$ $S_{sw} = 0$ $S_a = 0$)

$S_{FE} = 0$

$S_{DC} = 0$

FIGURE 1

HRS COVER SHEET

"non responsive based on revised scope"

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DOCUMENTATION RECORDS FOR HAZARD RANKING SYSTEM

INSTRUCTIONS: The purpose of these records is to provide a convenient way to prepare an auditable record of the data and documentation used to apply the Hazard Ranking System to a given facility. As briefly as possible, summarize the information you used to assign the score for each factor (e.g. "Waste quantity equals 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference that will make the document and for a given point easier to find. Include the location of the document and consider appending a copy of the relevant page(s) for ease in review.

FACILITY NAME: Pigeon Point Landfill

LOCATION: New Castle, Delaware

COORDINATES:

Latitude 39° 42' 10"

Longitude 75° 32' 00"

"non responsive based on revised scope"

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GROUND WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected (5 maximum):

Arsenic
Benzene
Ethylbenzene
Tetrachloroethylene

Reference nos. 10, 13, and 16

Rationale for attributing the contaminants to the facility:

The data supplied in reference no. 16 show elevated levels of arsenic, ethylbenzene, tetrachloroethylene, and benzene. The contaminants migrated through the base of the landfill and, in time, to and through the Columbia and Potomac aquifers. The sample data summary supplied by NUS Corporation and included with reference no. 16 is based on the data supplied by the Delaware Solid Waste Authority. The data summary shows benzene was initially detected in March 1984 in mid-site base well nos. 46 to 49. Later, in March 1985, it was detected in well nos. 27R and 28, Columbia and Potomac wells, respectively. Tetrachloroethylene was found in Potomac well no. 28 and base well nos. 46 through 49 in March 1984. In September 1984, it was found in Columbia well nos. 27R and 25R and Potomac well no. 28. In March 1985, the compound was found only in hydraulic fill well no. 1R. Ethylbenzene was discovered in base well nos. 46 and 47 in March 1984. Arsenic was found in base well nos. 46 to 49 in March 1984. In March 1985, arsenic was found in Potomac well nos. 28 and 29.

The contaminants are apparently migrating through the dredge spoil soils, which underlie the site, and into the aquifers of the Columbia and Potomac Formations. Some contaminants, in time, migrate through the aquifers and, hence, away from the wells.

Well nos. 1, 1A, 23R, 31, and 31A are considered to be upgradient on-site wells (groundwater flow direction is southeast). Well nos. 26, 32, 32A, 42, 42A, 29, and 29A, are considered to be side-gradient wells. All other wells are considered to be downgradient. It is believed that well nos. 41, 41A, 45, and 40 show no significant amounts of contamination because they are "washed out" with the fluctuating tides that most likely influence these wells.

Reference nos. 4, 7, 10, 13, and 16 (pages 2, 4, 5, 6, 7, 9, 45, 48, 49, 65, 66, 67, 68, 96, and 97)

"non responsive based on revised scope"

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2 ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

The site is immediately underlain by the Pleistocene deposits of the Columbia Formation. The Columbia consists of silts and fine sands interbedded with medium to coarse sands and gravels. The Columbia deposits are variable in thickness on a regular basis, but are believed to be between 25 to 75 feet thick in the site area.

Beneath the Columbia Formation is the Potomac Formation. The Potomac consists of nonmarine deposits of early to late Cretaceous Age. It consists lithologically of silts and clays interbedded with beds of sand and gravel. The Potomac is underlain by the crystalline bedrock complex. The top of this complex is approximately 250 feet below sea level. As mentioned in reference no. 5, the site is underlain by up to 20 feet (average) of dredge spoil material; however, as mentioned in the report (page 4), there seems to be an interconnection between these fine sands and the somewhat coarser, underlying Columbia deposits.

The Potomac is the most productive aquifer in this area. The Columbia is capable of producing large amounts of water and is an important aquifer south of the site area. Within the study area, however, the Columbia primarily provides recharge to the underlying Potomac aquifers.

The interconnection of these units beneath the site is evidenced by the presence of 6 contaminants attributable to the site in deep (Potomac Formation), downgradient, monitoring wells (well/sample nos. 28 and 29) at significantly higher levels than in a deep (Potomac Formation), upgradient, monitoring well (well/sample no. 26 R). These contaminants must have migrated vertically through the hydraulic fill material and Columbia Formation sediments to reach the underlying Potomac Formation.

The unconsolidated sediments underlying the site are considered, for Hazard Ranking System (HRS) purposes, to act as a single hydrologic unit. As such, the hydraulic fill, the Columbia Formation, and the Potomac Formation collectively comprise the aquifer of concern.

Reference nos. 2, 5, 8, 9, 14, and 16

Depth(s) from the ground surface to the highest seasonal level of the saturated zone (water table(s)) of the aquifer of concern:

N/A

Depth from the ground surface to the lowest point of waste disposal/storage:

N/A

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4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

The following compounds were detected in samples taken by Delaware Solid Waste Authority. Samples were taken from MWs as well as from the leachate collection system.

	Toxicity	Persistence	Matrix Value
Arsenic	3	3	18
Benzene	3	1	12
Ethylbenzene	2	1	9
Tetrachloroethylene	2	2	12
Toluene	2	1	9

Compound with highest score:

Arsenic

A value of 18 was assigned.

Reference nos. 12, 13, and 16

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum):

The Delaware Department of Natural Resources and Environmental Control (DE DNREC) draft preliminary assessment indicates that hazardous waste in the form of paint pigments and sludges, metal sludges, petroleum refinery wastes, PVC wastes, chemical process wastes, polylene and phenol resins, and toluene have been disposed of at the site. The quantity of hazardous substances dumped, however, is unknown. According to the Delaware Solid Waste Authority (DSWA), a total of approximately 6.1 million tons of solid waste were disposed at the site. No hazardous substances were disposed since DSWA assumed operations at the site. Prior to that time (January 1981), they have no records of hazardous waste disposal.

Reference nos. 4 (section I, page 1, section IV, page 2, 3 (V)) and 18

Basis of estimating and/or computing waste quantity:

Unknown amounts of hazardous substances have been disposed at the site. A conservative estimate of this unknown amount of waste gives this section a value of 1.

A value of 1 was assigned.

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Reference no. 4

5 TARGETS

Groundwater Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

Drinking water, no municipal water from alternate unthreatened sources is presently available.

A value of 3 was assigned.

Reference nos. 1, 3, 6, and 7

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

The nearest well currently used for potable water supplies is the ICI Americas, Incorporated - Atlas Point Plant's production well no. 11.

Reference nos. 1, 7, and 20

Distance to above well or building:

The above well is located (as measured from MW no. 28) approximately 0.5 mile southwest of the site.

A matrix value of 3 was assigned.

Reference nos. 1, 7, and 20

Population Served by Ground Water Wells Within a 3-Mile Radius

Identified water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

The following public supply wells draw from the aquifer of concern within a 3-mile radius of the site.*

Public Supply Wells	Population Served
Artesian Water Company -Collins Park Well field (1 well) -Jefferson Farms Well field (2 wells) -Castle Hills Well field (3 wells)	130,300 persons (Ref. 6)
City of New Castle Water Department -Well NC-3	5,000 persons (Ref. 23)
Total=	135,300 persons

*See target population map (reference no. 7) for well locations and the extent of the respective water supply companies.

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The Wilmington City Water Department serves much of the northern portion of the study area but obtains its water supply from an intake along Brandywine Creek outside of the area of concern.

ICI Americas, Incorporated - Atlas Point Plant utilizes 4 on-site production wells combined with water from the Wilmington Suburban Water Company for their potable and industrial water supplies.

Both the Wilmington City Water Department and the Wilmington Suburban Water Company obtain their water supplies from unthreatened sources (see reference nos. 6 and 7).

A value of 5 was assigned.

Reference nos. 1, 3, 6, and 7, 23

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

There are no irrigated crop lands within 3 miles of the site.

Reference no. 19

Total population served by groundwater within a 3-mile radius:

135,300 persons

A value of 5 was assigned.

A matrix value of 35 was assigned.

Reference nos. 1, 3, 6, 7, 20, 21, 22, 23, 24, and 25

"non responsive based on revised scope"

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SURFACE WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

No on-site surface water or sediment samples were taken.

A leachate collection system has been installed and has been operated since 1981. There is also a hydraulic fill dike on site, but it does not completely surround the facility.

Prior to 1981, no leachate collection lines were present in the western, northwestern, and southwestern portions of the landfill. It is reported (reference no. 4, section III, page 1) that, prior to the construction of the eastern portion of the leachate collection system in 1980, leachate from the landfill flowed directly into the Delaware River.

Since the landfill has a containment value of 0 with respect to surface wat
(Ref. 17,18), no overland migration pathway in which contaminants attributable to the site can reach the Delaware River, or any other surface waters, has been identified. As such, the Surface Water Route score will be 0.

A value of 0 was assigned.

Reference nos. 4 (section I, page 1, and section III, page 1), 10 (pages 6, 7, and 13), and 17.

Rationale for attributing the contaminants to the facility:

N/A

* * *

2 ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

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Average slope of facility in percent:

N/A

Name/description of nearest downslope surface water:

N/A

AIR ROUTE

1 OBSERVED RELEASE

Contaminants detected:

While crossing the site, FIT III members noticed OVA readings of up to 30 ppm. An HNU at the same location did not register. The gas was, therefore, determined to be methane. Inside the wet well, both an OVA and HNU recorded vapors near 100 ppm. As the readings were not taken within the breathing zone, no meteorological data were recorded and no upwind air sampling was conducted. An observed release cannot be sufficiently documented for HRS purposes.

Reference no. 10 (attachment 6)

Date and location of detection of contaminants:

N/A

Methods used to detect the contaminants:

N/A

Rationale for attributing the contaminants to the site:

N/A

* * *

2 WASTE CHARACTERISTICS

Reactivity and Incompatibility

"non responsive based on revised scope"

8-13-0

Most reactive compound:

N/A

Most incompatible pair of compounds:

N/A

FIRE AND EXPLOSION

1 DOCUMENTED THREAT

If either a state or local fire marshal has certified that the facility presents a significant fire or explosion threat to the public or to sensitive environments, document the certification:

Name/affiliation of fire marshal:

Fire Marshal Santa Barbara stated that this site has not been certified as a fire and explosion threat.

Reference no. 11

Date of Certification:

N/A

Comments:

If there is a demonstrated fire and explosion threat based on field observations, document the threat:

Inspectors reporting the threat:

N/A

Date of observations:

N/A

Methods used to document the threat:

N/A

Comments:

N/A

"non responsive based on revised scope"

8-13

DIRECT CONTACT

1 OBSERVED INCIDENT

Pertinent details of incident:

N/A

Location:

N/A

Date:

N/A

* * *

2 ACCESSIBILITY

Accessibility to Hazardous Substance

Measure(s) taken to limit access by humans or animals to the hazardous substances:

The facility is enclosed by a fence. There are no separate means to control entry.

A value of 2 was assigned.

Reference no. 10 (section 1, page 7)

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* * *

3 CONTAINMENT

Containment

Indicate whether the hazardous substance itself is accessible to direct contact:

The landfill was covered daily with 6 inches of material. Final closure of the site occurred in November 1985, with the application of 2 feet of cover material.

A value of 0 was assigned.

Reference nos. 10 (section 1, page 11, landfill site inspection report), 15, and 18

REFERENCES

Reference No.	Description of Reference
1.	Uncontrolled Hazardous Waste Site Ranking System; A User's Manual. National Oil and Hazardous Substances Contingency Plan, Appendix A (40 CFR 300) (47 FR 31219), July 16, 1982.
2.	Sundstrom R.W., T.E. Pickett, and R.D. Varrin, of Water Resources Center, under contract to Delaware State Planning Office. Hydrology Geology and Mineral Resources of the Coastal Zone of Delaware. Technical report no. 3. October 1975. (Prepared from an unpublished manuscript.)
3.	Artesian Water Company. Well fields, well data, and map of area wells.
4.	Delaware Department of Natural Resources and Environmental Control, for Mr. E. Skernolis, U.S. EPA Emergency and Remedial Response Information. A draft preliminary assessment of Pigeon Point Landfill. System Grant No. X-003282-01-1, March 1984.
5.	Ecology and Environment, Incorporated. FIT project. A Geohydraulic Assessment of Pigeon Point Landfill. TDD No. F3-8010-03. Task report to the Environmental Protection Agency Contract No. 68-01-6056.
6.	Water Resources Agency for New Castle County, Inventory of Public Water Systems in New Castle County. December 1980.
7.	United States Geological Survey. Wilmington South, Delaware Quadrangle, 7.5 Minute Series. Topographic Map. (Target population within 3-mile study area added by NUS Corporation.)
8.	United States Geological Survey Water Resources Investigation, in cooperation with U.S. Army Corps of Engineers and the Delaware Department of Natural Resources and Environmental Control. Hydrologic Data for the Potomac Formation in New Castle, Delaware by M.M. Martin and J.M. Denver. Open file report 81-916, 1982.
9.	Plitnik, Marilyn, EPA, with "non responsive based on revised scope" NUS FIT III. Telecon. March 6, 1985.

"non responsive based on revised scope"

Reference No.	Description of Reference
10.	Ecology and Environment, Incorporated. FIT project. Report on Pigeon Point Landfill, TDD No. F3-8101-17. Task report to the EPA contract no. 68-01-6056. (Prepared by "non responsive based on revised scope" and submitted to "non responsive based on revised scope"
11.	Barbara, Santa, New Castle County Fire Marshal, with "non responsive based on revised scope", NUS FIT III. Telecon. August 1, 1985.
12.	Sax, N. Irving. Dangerous Properties of Industrial Materials.
13.	West Coast Technical Services. Sampling by Versar. Sample data summary (by NUS Corporation, July 1985).
14.	Varrin and Pickett. Availability of Groundwater in New Castle County. Geologic cross section at Delaware Memorial Bridge. ICI Americas, Incorporated, Atlas Point Site, New Castle, Delaware.
15.	Pickert, Robert, Delaware Department of Natural Resources and Environmental Control, with "non responsive based on revised scope", NUS FIT III. Telecon. August 12, 1985.
16.	Brandy Associates, Incorporated, Duffield Associates. Delaware Solid Waste Authority. Analytical data for Pigeon Point Landfil. December 9, 1985.
17.	Duffield Associates, Delaware Solid Waste Authority. Leachate Collection System Schematic for Pigeon Point. June 2, 1985.
18.	Rohrbach, James, Delaware Solid Waste Authority, with "non responsive based on revised scope", NUS FIT III. Telecon. February 20, 1986.
19.	Hardesty, Marianne, New Castle County Soil Conservation Service, with "non responsive based on revised scope" NUS FIT III. Telecon. February 20, 1986.
20.	"non responsive based on revised scope" Atlas Point Plant Manager, ICI Americas, with "non responsive based on revised scope", NUS FIT III. Correspondence. August 21, 1984.
21.	"non responsive based on revised scope" ICI Americas, with Laura Boornazian, U.S. EPA III. Telecon. June 6, 1985.
22.	Lakshman, B.T., Artesian Water Company, with "non responsive based on revised scope" NUS FIT III. Telecon. February 21, 1986.

"non responsive based on revised scope"

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Reference No.	Description of Reference
23.	Moore, John, City of New Castle Water Department, with "non responsive based on revised scope" NUS FIT III. Telecons. July 7 and 15, 1986.
24.	Hanley, John, Wilmington City Water Department, with "non responsive based on revised scope" NUS FIT III. Telecon. July 10, 1986.
25.	"non responsive based on revised scope" ICI Americas, Incorporated - Atlas Point Plant, with "non responsive based on revised scope" NUS FIT III. Telecon. July 10, 1986.

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8-13-86

ORIGINAL
(Red)

ORIGINAL
(Red)

ORIGINAL
(Red)

ORIGINAL
(Red)

Ground Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Release	0 (45)	1	45	45	3.1
If observed release is given a score of 45, proceed to line 4. If observed release is given a score of 0, proceed to line 2.					
2 Route Characteristics					3.2
Depth to Aquifer of Concern	0 1 2 3	2		6	
Net Precipitation	0 1 2 3	1		3	
Permeability of the Unsaturated Zone	0 1 2 3	1		3	
Physical State	0 1 2 3	1		3	
Total Route Characteristics Score				15	
3 Containment	0 1 2 3	1		3	3.3
4 Waste Characteristics					3.4
Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
Total Waste Characteristics Score			19	26	
5 Targets					3.5
Ground Water Use	0 1 2 (3)	3	9	9	
Distance to Nearest Well/Population Served	0 4 6 8 10 / 12 16 18 20 / 24 30 32 (35) 40	1	35	40	
Total Targets Score			44	49	
6 If line 1 is 45, multiply 1 x 4 x 5. If line 1 is 0, multiply 2 x 3 x 4 x 5			37,620	57,330	
7 Divide line 6 by 57,330 and multiply by 100		S_{gw} = 65.62	44.96		

FIGURE 2
GROUND WATER ROUTE WORK SHEET

173
= 25,95

[redacted] "non responsive based on revised scope"

ORIGINAL (Red)

Surface Water Route Work Sheet						
Rating Factor	Assigned Value (Circle One)		Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Release	(0)	45	1	O	45	4.1
If observed release is given a value of 45, proceed to line 4. If observed release is given a value of 0, proceed to line 2.						
2 Route Characteristics						4.2
Facility Slope and Intervening Terrain	0 1 2 3		1		3	
1-yr. 24-hr. Rainfall	0 1 2 3		1		3	
Distance to Nearest Surface Water	0 1 2 3		2		6	
Physical State	0 1 2 3		1		3	
Total Route Characteristics Score					15	
3 Containment	0 1 2 3		1	O	3	4.3
4 Waste Characteristics						4.4
Toxicity/Persistence	0 3 6 9 12 15 18		1		18	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8		1		8	
Total Waste Characteristics Score					26	
5 Targets						4.5
Surface Water Use	0 1 2 3		3		9	
Distance to a Sensitive Environment	0 1 2 3		2		6	
Population Served/Distance to Water Intake Downstream	0 4 6 8 10 12 16 18 20 24 30 32 35 40		1		40	
Total Targets Score				-	55	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5				O	84,350	
7 Divide line 6 by 84,350 and multiply by 100			S_{sw} =	O		

FIGURE 7
SURFACE WATER ROUTE WORK SHEET

"non responsive based on revised scope"

ORIGINAL (Red)

ORIGINAL (Red)

Air Route Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
[1] Observed Release	0 45	1	0	45	5.1
Date and Location:					
Sampling Protocol:					
If line [1] is 0, the S_a = 0. Enter on line [5]. If line [1] is 45, then proceed to line [2].					
[2] Waste Characteristics					5.2
Reactivity and Incompatibility	0 1 2 3	1		3	
Toxicity	0 1 2 3	3		9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
[3] Targets					5.3
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30	
Distance to Sensitive Environment	0 1 2 3	2		6	
Land Use	0 1 2 3	1		3	
	Total Targets Score			39	
[4] Multiply [1] x [2] x [3]				35,100	
[5] Divide line [4] by 35,100 and multiply by 100		S_a = 0			

FIGURE 9
AIR ROUTE WORK SHEET

"non responsive based on revised scope"

	S	S^2
Groundwater Route Score (S_{gw})	65.62	4305.98
Surface Water Route Score (S_{sw})	0	0
Air Route Score (S_a)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$		4305.98
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		65.62
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} / 1.73 = S_M =$		37.93

FIGURE 10
WORKSHEET FOR COMPUTING S_M

"non responsive based on revised scope"

ORIGINAL (Red)

Fire and Explosion Work Sheet					
Rating Factor_	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1 Containment	1 3	1		3	7.1
2 Waste Characteristics					7.2
Direct Evidence	0 3	1		3	
Ignitability	0 1 2 3	1		3	
Reactivity	0 1 2 3	1		3	
Incompatibility	0 1 2 3	1		3	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
Total Waste Characteristics Score				20	
3 Targets					7.3
Distance to Nearest Population	0 1 2 3 4 5	1		5	
Distance to Nearest Building	0 1 2 3	1		3	
Distance to Sensitive Environment	0 1 2 3	1		3	
Land Use	0 1 2 3	1		3	
Population Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Buildings Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Total Targets Score				24	
4 Multiply 1 x 2 x 3				1,440	
5 Divide line 4 by 1,440 and multiply by 100			S_{FE} =		

FIGURE 11
FIRE AND EXPLOSION WORK SHEE

"non responsive based on revised scope"

Direct Contact Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Incident	(0) 45	1	0	45	8.1
If line 1 is 45, proceed to line 4 If line 1 is 0, proceed to line 2					
2 Accessibility	0 1 (2) 3	1	2	3	8.2
3 Containment	(0) 15	1	0	15	8.3
4 Waste Characteristics Toxicity	0 1 2 3	5		15	8.4
5 Targets					8.5
Population Within a 1-Mile Radius	0 1 2 3 4 5	4		20	
Distance to a Critical Habitat	0 1 2 3	4		12	
Total Targets Score				32	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			0	21,600	
7 Divide line 6 by 21,600 and multiply by 100		SOC =	0		

FIGURE 12
DIRECT CONTACT WORK SHEET

"non responsive based on revised scope"

ORIGINAL
(Red)

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

INSTRUCTIONS: The purpose of these records is to provide a convenient way to prepare an auditable record of the data and documentation used to apply the Hazard Ranking System to a given facility. As briefly as possible, summarize the information you used to assign the score for each factor (e.g. "Waste quantity equals 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference that will make the document and for a given point easier to find. Include the location of the document and consider appending a copy of the relevant page(s) for ease in review.

FACILITY NAME: Pigeon Point Landfill

LOCATION: New Castle, Delaware

COORDINATES:

Latitude 39° 42' 10"

Longitude 75° 32' 00"

"non responsive based on revised scope"

8-13

GROUND WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected (5 maximum):

Arsenic
Benzene
Ethylbenzene
Tetrachloroethylene

Reference nos. 10, 13, and 16

Rationale for attributing the contaminants to the facility:

The data supplied in reference no. 16 show elevated levels of arsenic, ethylbenzene, tetrachloroethylene, and benzene. The contaminants migrated through the base of the landfill and, in time, to and through the Columbia and Potomac aquifers. The sample data summary supplied by NUS Corporation and included with reference no. 16 is based on the data supplied by the Delaware Solid Waste Authority. The data summary shows benzene was initially detected in March 1984 in mid-site base well nos. 46 to 49. Later, in March 1985, it was detected in well nos. 27R and 28, Columbia and Potomac wells, respectively. Tetrachloroethylene was found in Potomac well no. 28 and base well nos. 46 through 49 in March 1984. In September 1984, it was found in Columbia well nos. 27R and 25R and Potomac well no. 28. In March 1985, the compound was found only in hydraulic fill well no. 1R. Ethylbenzene was discovered in base well nos. 46 and 47 in March 1984. Arsenic was found in base well nos. 46 to 49 in March 1984. In March 1985, arsenic was found in Potomac well nos. 28 and 29.

The contaminants are apparently migrating through the dredge spoil soils, which underlie the site, and into the aquifers of the Columbia and Potomac Formations. Some contaminants, in time, migrate through the aquifers and, hence, away from the wells.

hyd. fill 1R no well hyd. fill

Well nos. 1, 1A, 23R, 31, and 31A are considered to be upgradient on-site wells (groundwater flow direction is southeast). Well nos. 26, 32, 32A, 42, 42A, 29, and 29A, are considered to be side-gradient wells. All other wells are considered to be downgradient. It is believed that well nos. 41, 41A, 45, and 40 show no significant amounts of contamination because they are "washed out" with the fluctuating tides that most likely influence these wells.

Reference nos. 4, 7, 10, 13, and 16 (pages 2, 4, 5, 6, 7, 9, 45, 48, 49, 65, 66, 67, 68, 96, and 97)

"non responsive based on revised scope"

ORIGINAL (Red)

2 ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

The site is immediately underlain by the Pleistocene deposits of the Columbia Formation. The Columbia consists of silts and fine sands interbedded with medium to coarse sands and gravels. The Columbia deposits are variable in thickness on a regular basis, but are believed to be between 25 to 75 feet thick in the site area.

Beneath the Columbia Formation is the Potomac Formation. The Potomac consists of nonmarine deposits of early to late Cretaceous Age. It consists lithologically of silts and clays interbedded with beds of sand and gravel. The Potomac is underlain by the crystalline bedrock complex. The top of this complex is approximately 250 feet below sea level. As mentioned in reference no. 5, the site is underlain by up to 20 feet (average) of dredge spoil material; however, as mentioned in the report (page 4), there seems to be an interconnection between these fine sands and the somewhat coarser, underlying Columbia deposits.

The Potomac is the most productive aquifer in this area. The Columbia is capable of producing large amounts of water and is an important aquifer south of the site area. Within the study area, however, the Columbia primarily provides recharge to the underlying Potomac aquifers.

The interconnection of these units beneath the site is evidenced by the presence of 6 contaminants attributable to the site in deep (Potomac Formation), downgradient, monitoring wells (well/sample nos. 28 and 29) at significantly higher levels than in a deep (Potomac Formation), upgradient, monitoring well (well/sample no. 26 R). These contaminants must have migrated vertically through the hydraulic fill material and Columbia Formation sediments to reach the underlying Potomac Formation.

The unconsolidated sediments underlying the site are considered, for Hazard Ranking System (HRS) purposes, to act as a single hydrologic unit. As such, the hydraulic fill, the Columbia Formation, and the Potomac Formation collectively comprise the aquifer of concern.

Reference nos. 2, 5, 8, 9, 14, and 16

Depth(s) from the ground surface to the highest seasonal level of the saturated zone (water table(s)) of the aquifer of concern:

N/A

Depth from the ground surface to the lowest point of waste disposal/storage:

N/A

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Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):

N/A

Mean annual lake or seasonal evaporation (list months for seasonal):

N/A

Net precipitation (subtract the above figures):

N/A

Permeability Associated with Unsaturated Zone

Type of geological material in unsaturated zone:

N/A

Permeability associated soil type:

N/A

Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

N/A

* * *

3 CONTAINMENT

"non responsive based on revised scope"

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Containment

Method(s) of waste or leachate containment evaluated:

N/A

Method with highest score:

N/A

ORIGINAL (Red)

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

The following compounds were detected in samples taken by Delaware Solid Waste Authority. Samples were taken from MWs as well as from the leachate collection system.

	Toxicity	Persistence	Matrix Value
Arsenic	3	3	18
Benzene	3	1	12
Ethylbenzene	2	1	9
Tetrachloroethylene	2	2	12
Toluene	2	1	9

Compound with highest score:

Arsenic

A value of 18 was assigned.

Reference nos. 12, 13, and 16

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum):

The Delaware Department of Natural Resources and Environmental Control (DE DNREC) draft preliminary assessment indicates that hazardous waste in the form of paint pigments and sludges, metal sludges, petroleum refinery wastes, PVC wastes, chemical process wastes, polylene and phenol resins, and toluene have been disposed of at the site. The quantity of hazardous substances dumped, however, is unknown. According to the Delaware Solid Waste Authority (DSWA), a total of approximately 6.1 million tons of solid waste were disposed at the site. No hazardous substances were disposed since DSWA assumed operations at the site. Prior to that time (January 1981), they have no records of hazardous waste disposal.

Reference nos. 4 (section I, page 1, section IV, page 2, 3 (V)) and 18

Basis of estimating and/or computing waste quantity:

Unknown amounts of hazardous substances have been disposed at the site. A conservative estimate of this unknown amount of waste gives this section a value of 1.

A value of 1 was assigned.

Reference no. 4

"non responsive based on revised scope"

5 TARGETS

Groundwater Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

Drinking water, no municipal water from alternate unthreatened sources is presently available.

A value of 3 was assigned.

Reference nos. 1, 3, 6, and 7

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

The nearest well currently used for potable water supplies is the ICI Americas, Incorporated - Atlas Point Plant's production well no. 11.

Reference nos. 1, 7, and 20

Distance to above well or building:

The above well is located (as measured from MW no. 28) approximately 0.5 mile southwest of the site.

A matrix value of 3 was assigned.

Reference nos. 1, 7, and 20

Population Served by Ground Water Wells Within a 3-Mile Radius

Identified water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

The following public supply wells draw from the aquifer of concern within a 3-mile radius of the site.*

Public Supply Wells	Population Served
Artesian Water Company -Collins Park Well field (1 well) -Jefferson Farms Well field (2 wells) -Castle Hills Well field (3 wells)	130,300 persons (Ref. 6)
City of New Castle Water Department -Well NC-3	5,000 persons (Ref. 23)
Total=	135,300 persons

*See target population map (reference no. 7) for well locations and the extent of the respective water supply companies.

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The Wilmington City Water Department serves much of the northern portion of the study area but obtains its water supply from an intake along Brandywine Creek outside of the area of concern.

ICI Americas, Incorporated - Atlas Point Plant utilizes 4 on-site production wells combined with water from the Wilmington Suburban Water Company for their potable and industrial water supplies.

Both the Wilmington City Water Department and the Wilmington Suburban Water Company obtain their water supplies from unthreatened sources (see reference nos. 6 and 7).

A value of 5 was assigned.

Reference nos. 1, 3, 6, and 7, 23

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

There are no irrigated crop lands within 3 miles of the site.

Reference no. 19

Total population served by groundwater within a 3-mile radius:

135,300 persons

A value of 5 was assigned.

A matrix value of 35 was assigned.

Reference nos. 1, 3, 6, 7, 20, 21, 22, 23, 24, and 25

"non responsive based on revised scope"

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SURFACE WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

No on-site surface water or sediment samples were taken.

A leachate collection system has been installed and has been operated since 1981. There is also a hydraulic fill dike on site, but it does not completely surround the facility.

Prior to 1981, no leachate collection lines were present in the western, northwestern, and southwestern portions of the landfill. It is reported (reference no. 4, section III, page 1) that, prior to the construction of the eastern portion of the leachate collection system in 1980, leachate from the landfill flowed directly into the Delaware River.

Since the landfill has a containment value of 0 with respect to surface water (Ref. 17,18), no overland migration pathway in which contaminants attributable to the site can reach the Delaware River, or any other surface waters, has been identified. As such, the Surface Water Route score will be 0.

A value of 0 was assigned.

Reference nos. 4 (section I, page 1, and section III, page 1), 10 (pages 6, 7, and 13), and 17.

Rationale for attributing the contaminants to the facility:

N/A

* * *

2 ROUTE CHARACTERISTICS

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Facility Slope and Intervening Terrain

Average slope of facility in percent:

N/A

Name/description of nearest downslope surface water:

N/A

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Average slope of terrain between facility and above-cited surface water body in percent:

N/A

Is the facility located either totally or partially in surface water?

N/A

Is the facility completely surrounded by areas of higher elevation?

N/A

1-Year 24-Hour Rainfall in Inches

N/A

Distance to Nearest Downslope Surface Water

N/A

Physical State of Waste

N/A

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* * *

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

N/A

Method with highest score:

N/A

* * *

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated

N/A

Compound with highest score:

N/A

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum):

N/A

Basis of estimating and/or computing waste quantity:

N/A

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* * *

5 TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

N/A

Is there tidal influence?

N/A

ORIGINAL (Red)

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

N/A

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

N/A

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

N/A

Population Served by Surface Water

Location(s) of water-supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

N/A

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):

N/A

Total population served:

N/A

"non responsive based on revised scope"

Name/description of nearest of above water bodies:

N/A

Distance to above-cited intakes, measured in stream miles.

N/A - no intakes

A value of 0 was assigned.

AIR ROUTE

1 OBSERVED RELEASE

Contaminants detected:

While crossing the site, FIT III members noticed OVA readings of up to 30 ppm. An HNU at the same location did not register. The gas was, therefore, determined to be methane. Inside the wet well, both an OVA and HNU recorded vapors near 100 ppm. As the readings were not taken within the breathing zone, no meteorological data were recorded and no upwind air sampling was conducted. An observed release cannot be sufficiently documented for HRS purposes.

Reference no. 10 (attachment 6)

Date and location of detection of contaminants:

N/A

Methods used to detect the contaminants:

N/A

Rationale for attributing the contaminants to the site:

N/A

* * *

2 WASTE CHARACTERISTICS

Reactivity and Incompatibility

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Most reactive compound:

N/A

Most incompatible pair of compounds:

N/A

ORIGINAL (red)

Toxicity

Most toxic compound:

N/A

Hazardous Waste Quantity

Total quantity of hazardous waste:

N/A

Basis of estimating and/or computing waste quantity:

N/A

* * *

3 TARGETS

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:
0 to 4 mi 0 to 1 mi 0 to 1/2 mi 0 to 1/4 mi

N/A

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

N/A

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

N/A

"non responsive based on revised scope"

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Distance to critical habitat of an endangered species, if 1 mile or less:

N/A

Land Use

Distance to commercial/industrial area, if 1 mile or less:

N/A

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

N/A

Distance to residential area, if 2 miles or less:

N/A

Distance to agricultural land in production within past 5 years, if 1 mile or less:

N/A

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

N/A

Is a historic or landmark site (National Register or Historic Places and National Landmarks) within the view of the site?

N/A

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ORIGINAL (Red)

FIRE AND EXPLOSION

1 DOCUMENTED THREAT

If either a state or local fire marshal has certified that the facility presents a significant fire or explosion threat to the public or to sensitive environments, document the certification:

Name/affiliation of fire marshal:

Fire Marshal Santa Barbara stated that this site has not been certified as a fire and explosion threat.

Reference no. 11

Date of Certification:

N/A

Comments:

If there is a demonstrated fire and explosion threat based on field observations, document the threat:

Inspectors reporting the threat:

N/A

Date of observations:

N/A

Methods used to document the threat:

N/A

Comments:

N/A

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2 CONTAINMENT

Containment

Measure(s) taken to minimize or prevent hazardous substances from catching fire or exploding:

N/A

* * *

3 WASTE CHARACTERISTICS

Direct Evidence

Type of measures taken:

N/A

Date and location of positive measurements:

N/A

Ignitability

Compound evaluated:

N/A

Compound with highest score:

N/A

"non responsive based on revised scope"

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Reactivity

Compounds evaluated:

N/A

Compound with highest score:

N/A

Incompatibility

Compounds evaluated:

N/A

Most incompatible pair of compounds:

N/A

Hazardous Waste Quantity

Total quantity of hazardous waste:

N/A

Basis of estimating and/or computing waste quantity:

N/A

"non responsive based on revised scope"

ORIGINAL
(Red)

4 TARGETS

Distance to Nearest Population

N/A

Distance to Nearest Building

N/A

Distance to Nearest Sensitive Environment

Distance to wetlands, if less than 100 feet:

N/A

Distance to critical habitat of an endangered species, if greater than 1/2 mile:

N/A

Land Use

Distance to commercial industrial area, if 1 mile or less:

N/A

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

N/A

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Distance to residential area, if 2 miles or less:

N/A

Distance to agricultural land in production within past 5 years, if 1 mile or less:

N/A

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

N/A

Is a historic or landmark site (National Register or Historic Places and National Natural Landmarks) within the view of the site?

N/A

Population Within 2-Mile Radius

N/A

Number of Buildings Within a 2-Mile Radius

N/A

"non responsive based on revised scope"

DIRECT CONTACT

1 OBSERVED INCIDENT

Pertinent details of incident:

N/A

Location:

N/A

Date:

N/A

* * *

2 ACCESSIBILITY

Accessibility to Hazardous Substance

Measure(s) taken to limit access by humans or animals to the hazardous substances:

The facility is enclosed by a fence. There are no separate means to control entry.

A value of 2 was assigned.

Reference no. 10 (section 1, page 7)

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* * *

3 CONTAINMENT

Containment

Indicate whether the hazardous substance itself is accessible to direct contact:

The landfill was covered daily with 6 inches of material. Final closure of the site occurred in November 1985, with the application of 2 feet of cover material.

A value of 0 was assigned.

Reference nos. 10 (section 1, page 11, landfill site inspection report), 15, and 18

4 WASTE CHARACTERISTICS

Toxicity

Compounds evaluated:

N/A

Compound with highest score:

N/A

* * *

5 TARGETS

Population Within 1-mile Radius

N/A

Distance to a Critical Habitat of an Endangered Species

N/A

"non responsive based on revised scope"

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ORIGINAL (Red)

REFERENCES

Reference No.	Description of Reference
1.	Uncontrolled Hazardous Waste Site Ranking System; A User's Manual. National Oil and Hazardous Substances Contingency Plan, Appendix A (40 CFR 300) (47 FR 31219), July 16, 1982.
2.	Sundstrom R.W., T.E. Pickett, and R.D. Varrin, of Water Resources Center, under contract to Delaware State Planning Office. Hydrology Geology and Mineral Resources of the Coastal Zone of Delaware. Technical report no. 3. October 1975. (Prepared from an unpublished manuscript.)
3.	Artesian Water Company. Well fields, well data, and map of area wells.
4.	Delaware Department of Natural Resources and Environmental Control, for Mr. E. Skernolis, U.S. EPA Emergency and Remedial Response Information. A draft preliminary assessment of Pigeon Point Landfill. System Grant No. X-003282-01-1, March 1984.
5.	Ecology and Environment, Incorporated. FIT project. A Geohydraulic Assessment of Pigeon Point Landfill. TDD No. F3-8010-03. Task report to the Environmental Protection Agency Contract No. 68-01-6056.
6.	Water Resources Agency for New Castle County, Inventory of Public Water Systems in New Castle County. December 1980.
7.	United States Geological Survey. Wilmington South, Delaware Quadrangle, 7.5 Minute Series. Topographic Map. (Target population within 3-mile study area added by NUS Corporation.)
8.	United States Geological Survey Water Resources Investigation, in cooperation with U.S. Army Corps of Engineers and the Delaware Department of Natural Resources and Environmental Control. Hydrologic Data for the Potomac Formation in New Castle, Delaware by M.M. Martin and J.M. Denver. Open file report 81-916, 1982.
9.	Plitnik, Marilyn, EPA, with [redacted] NUS FIT III. Telecon. March 6, 1985.

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QA David E Egan 8-13-86

Reference No. | Description of Reference

10. Ecology and Environment, Incorporated. FIT project. Report on Pigeon Point Landfill, TDD No. F3-8101-17. Task report to the EPA contract no. 68-01-6056. (Prepared by "non responsive based on revised scope" and submitted to "non responsive based on revised scope"

11. Barbara, Santa, New Castle County Fire Marshal, with "non responsive based on revised scope" NUS FIT III. Telecon. August 1, 1985.

12. Sax, N. Irving. Dangerous Properties of Industrial Materials.

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14. Varrin and Pickett. Availability of Groundwater in New Castle County. Geologic cross section at Delaware Memorial Bridge. ICI Americas, Incorporated, Atlas Point Site, New Castle, Delaware.

15. Pickert, Robert, Delaware Department of Natural Resources and Environmental Control, with "non responsive based on revised scope" NUS FIT III. Telecon. August 12, 1985.

16. Brandy Associates, Incorporated, Duffield Associates. Delaware Solid Waste Authority. Analytical data for Pigeon Point Landfil. December 9, 1985.

17. Duffield Associates, Delaware Solid Waste Authority. Leachate Collection System Schematic for Pigeon Point. June 2, 1985.

18. Rohrbach, James, Delaware Solid Waste Authority, with "non responsive based on revised scope" NUS FIT III. Telecon. February 20, 1986.

19. Hardesty, Marianne, New Castle County Soil Conservation Service, with "non responsive based on revised scope" NUS FIT III. Telecon. February 20, 1986.

20. "non responsive based on revised scope" Atlas Point Plant Manager, ICI Americas, with "non responsive based on revised scope" NUS FIT III. Correspondence. August 21, 1984.

21. "non responsive based on revised scope" ICI Americas, with Laura Boornazian, U.S. EPA III. Telecon. June 6, 1985.

22. Lakshman, B.T., Artesian Water Company, with "non responsive based on revised scope" NUS FIT III. Telecon. February 21, 1986.

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Reference No.	Description of Reference
23.	Moore, John, City of New Castle Water Department, with "non responsive based on revised scope" NUS FIT III. Telecons. July 7 and 15, 1986.
24.	Hanley, John, Wilmington City Water Department, with "non responsive based on revised scope" NUS FIT III. Telecon. July 10, 1986.
25.	Hermes, Mark, ICI Americas, Incorporated - Atlas Point Plant, with "non responsive based on revised scope" NUS FIT III. Telecon. July 10, 1986.

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REEVIS AND REEVIS CLAY PIT

PFF ORIGINAL (Red)

Ground Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
1 Observed Release	0 45	1		45	3.1
If observed release is given a score of 45, proceed to line 4. If observed release is given a score of 0, proceed to line 2.					
2 Route Characteristics					3.2
Depth to Aquifer of Concern	0 1 2 (3)	2	6	6	
Net Precipitation	0 1 (2) 3	1	2	3	
Permeability of the Unsaturated Zone	0 1 (2) 3	1	2	3	
Physical State	0 (1) 2 3	1	1	3	
Total Route Characteristics Score			11	15	
3 Containment	0 1 2 (3)	1	3	3	3.3
4 Waste Characteristics					3.4
Toxicity/Persistence	0 3 6 9 (12) 15 18	1	12	18	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
Total Waste Characteristics Score			13	26	
5 Targets					3.5
Ground Water Use	0 1 2 (3)	3	9	9	
Distance to Nearest Well/Population Served	0 4 6 8 10 / 12 16 18 20 / 24 30 32 35 (40)	1	40	40	
Total Targets Score			49	49	
6 If line 1 is 45, multiply 1 x 4 x 5 / If line 1 is 0, multiply 2 x 3 x 4 x 5				57,330	
7 Divide line 6 by 57,330 and multiply by 100		S_{gw} =	36.67		

FIGURE 2
GROUND WATER ROUTE WORK SHEET

$S_M = 21.21$

PFE

ORIGINAL (Red)

Surface Water Route Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1 Observed Release	0 45	1		45	4.1
If observed release is given a value of 45, proceed to line 4. If observed release is given a value of 0, proceed to line 2.					
2 Route Characteristics					4.2
Facility Slope and Intervening Terrain	0 1 (2) 3	1	2	3	
1-yr. 24-hr. Rainfall	0 1 (2) 3	1	2	3	
Distance to Nearest Surface Water	0 1 2 (3)	2	6	6	
Physical State	0 1 2 (3)	1	3	3	
Total Route Characteristics Score			13	15	
3 Containment	0 (1) 2 3	1	1	3	4.3
4 Waste Characteristics					4.4
Toxicity/Persistence	0 3 6 9 (12) 15 18	1	12	18	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
Total Waste Characteristics Score			13	26	
5 Targets					4.5
Surface Water Use	0 1 (2) 3	3	6	9	
Distance to a Sensitive Environment	(0) 1 2 3	2	0	6	
Population Served/Distance to Water Intake Downstream	(0) 4 6 8 10 12 16 18 20 24 30 32 35 40	1	6	40	
Total Targets Score			6	55	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5				64,350	
7 Divide line 6 by 64,350 and multiply by 100		S_{SW} =	1.57		

FIGURE 7
SURFACE WATER ROUTE WORK SHEET

ORIGINAL (Red) PFE

Air Route Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)	
1 Observed Release	0 45	1		45	5.1	
Date and Location:						
Sampling Protocol:						
If line 1 is 0, the S_a = 0. Enter on line 5. If line 1 is 45, then proceed to line 2.						
2 Waste Characteristics						
Reactivity and Incompatibility	0 1 2 3	1		3	5.2	
Toxicity	0 1 2 3	3		9		
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8		
	Total Waste Characteristics Score			20		
3 Targets						
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30	5.3	
Distance to Sensitive Environment	0 1 2 3	2		6		
Land Use	0 1 2 3	1		3		
	Total Targets Score			39		
4 Multiply 1 x 2 x 3				35,100		
5 Divide line 4 by 35,100 and multiply by 100	S_a =					

FIGURE 9
AIR ROUTE WORK SHEET